

Upper Mississippi River Nine-Foot Channel Project,
Lock and Dam Complex Number 17

HAER No. IL-28

Spanning the Upper Mississippi River between
New Boston, Mercer County, Illinois
and
Louisa County, Iowa

HAER
ILL,
66-NEB0,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Rocky Mountain Regional Office
National Park Service
U. S. Department of the Interior
P. O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

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Location: Located on the Upper Mississippi River near Boston, Illinois, and 437.1 river miles upstream from the confluence of the Ohio and Mississippi rivers. The complex stretches across the river at a wide point where there are several marshy islands, and the shore on both sides is mainly marsh and slough. A federal Upper Mississippi River Wildlife and Fish Refuge occupies the islands and extensive marshes and sloughs on the Iowa shore, both upstream and downstream from the dam. The esplanade adjoins the river side of the Bay Island levee running along the Illinois shore. The lock is just riverward of the esplanade with the movable section of the dam tying to the westernmost lock wall. The earthen embankment section of the dam extends from the movable section across Otter Island to the Louisa County levee running along the Iowa shore. Corps Drawing Numbers M-L 17 10/2; 10/2A; 10/3; 10/6; HAER Photograph Numbers IL-28-1 through IL-28-78.

Dates of Construction: 1935-1939

Present Owner: U. S. Government
Rock Island District
Corps of Engineers

Present Use: River navigation/hydrology control

Significance: The U. S. Army Corps of Engineers Nine-Foot Channel Project (1927-1940) represents the culmination of a 100-year effort to improve the navigability of the Upper Mississippi River between the mouth of the Missouri River and Minneapolis, Minnesota. This specific project arose as a response to the farm crisis of the 1920s. Proponents of the New Deal adopted the project and gave speed to its construction as a means of providing public employment during the more general depression of the 1930s. By the 1940s, the completed project had converted over 650 miles of free-flowing river into a series of interconnected reservoirs which ensured enough water for fully loaded modern boats and barges to navigate the system. This constituted a significant alteration of the natural environment of the Upper Mississippi River. However, the project also brought economic benefits to the communities along and around the river corridor and lead to new recreational opportunities for the entire region.

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 2)

The Upper Mississippi River Nine-Foot Channel Project inaugurated a new development in slack-water navigation system dam practice in the United States: the adoption of a non-navigable dam containing both roller and Tainter gates. Prior to the Corps' 1930 decision to build non-navigable dams on the Upper Mississippi River, United States Army engineering practice had, nearly universally, been to construct navigable dams, permitting open-river navigation at higher river stages. By 1930, European engineers had been using roller gates in dams extensively for over 25 years. However, only ten such structures had been built in the United States, and these were all located on reaches of rivers where ensuring navigability of any sort was not a design concern. It was not until 1925-1926 that civilian engineers pioneered the use, in the United States, of roller gates in combination with other types of gates. Most of the Corps' Upper Mississippi River project dam designs expanded upon this development, incorporating both roller and Tainter gates. The Corps' shift from navigable to non-navigable dams demonstrate the influence of shipping techniques on navigable waterway improvement technology. It also exemplifies the cautious nature of American Army engineers response to changes in shipping. The Corps' choice of this particular type of non-navigable movable dam illustrates the influence of the hydraulic characteristics of individual rivers on the selection of waterway improvement technologies. It also evidences the manner in which critical engineering design developments are disseminated and become accepted.

Ironically, the Upper Mississippi River Nine-Foot Channel Project also resulted in the obsolescence, by the project's end, of combination roller and Tainter gate dams. Technological advances resulting from the research and development incidental to the design and construction of the 26 lock and dam systems in this project enabled U. S. Army Corps of Engineers to develop both submersible and non-submersible Tainter gates which nearly matched the capabilities of the roller gates. Once these less expensive and easier operated and maintained gates had been developed, American engineers ceased designing or constructing combination roller and Tainter gate dams. The Corps'

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 3)

creation of a new dam type and its subsequent
obsolescence during the course of a single project
dramatically illustrates both the evolutionary nature
of American engineering in general and the Nine-Foot
Channel Project in particular (Text, pages 11 and
49-50. See HAER No. IA-23 for complete history,
footnotes and bibliography).

Historian:

Mary Yeater Rathbun

August 1988

PART I. HISTORICAL INFORMATION

A. Physical History:

1. Dates of Erection: 1935-1939
2. Architect/Engineer: U. S. Corps of Engineers, Rock Island District
3. Original and Subsequent Owners: U. S. Government--Rock Island District, Army Corps of Engineers
4. Builders, Contractors, Suppliers:

General Contractor--Lock and Access Road: Massman Construction Company and Massman-Peterson Company, Kansas City, Missouri

Subcontractors:

Edward M. Rocho.....Roadway
Freeport, Illinois
Tri-State Dredging.....Provided 10-inch diesel, cutter-
head suction dredge
Independent Bridge Company.....Fabrication, erection, and place-
Pittsburgh, Pennsylvania ment of structural steel: tainter
valves, miter gates, operating
machinery for both

General Contractor--Dam and Central Control Station Construction:
Maxon Construction, Dayton, Ohio

Subcontractors:

R. C. Mahon Company.....Fabrication, erection, and place-
Detroit, Michigan ment of gate operating machinery
and structural steel: roller and
tainter gates, service bridge, etc.
H. E. Pederson.....Placed all reinforcing steel
LaCrosse, Wisconsin
Leder Pre-Cast Pile Company.....Built concrete piling for storage
Sioux City, Iowa yard and central control station
R. S. Langman.....Construction of central control
Rock Island, Illinois station
Zimmer Brothers Company.....Placed deep well pump for central
Moline, Illinois control station
Burlington Tent and Awning Co.Placed barrel roof on roller gate
Burlington, Iowa pier houses

Upper Mississippi River Nine-Foot Channel
 Project, Lock and Dam Number 17
 HAER No. IL-28
 (Page 5)

D. E. Edwards.....Drilled and developed well for
 West Branch, Iowa central control station
 Fries-Walters Company.....Erected dam electrical
 Chicago, Illinois installations
 L. A. Pokren.....Placed electrical installation in
 Burlington, Iowa central control station
 Thomas Strickland.....Erected steel for central control
 Rock Island, Illinois station
 Rock Island Glass Company.....Glazed sash and doors of central
 Rock Island, Illinois control station
 C. Holmquist and Company.....Placed Barret roof and sheet metal
 Moline, Illinois central control station
 Melvin McKay Inc.Placed plumbing and heating in
 Rock Island, Illinois central control station
 Charles Nuss.....Painted exposed metal in central
 Burlington, Iowa control station

General Contractor--Power, Control, and Lighting System Construction:
 Dearborn Electrical Construction Company, Chicago, Illinois

General Contractor--Esplanade Construction: Fred R. McKenzie,
 Gladstone, Illinois

5. Original Plans and Construction:

U. S. Army Corps of Engineers, Rock Island District, plans submitted
 by senior engineer Edwin E. Abbott.

6. Alterations and Additions:

<u>Item</u>	<u>Year</u>
Land wall and lock gate handrails lowered by one rail and new handrail made from salvaged materials installed on both edges of each lock wall and on upstream side of walkways on top of lock gates	ca. 1945
Construction-handrail on upstream side of dam service bridge	ca. 1945
Construction-800-foot earthen upper approach dike	1950-1951
Construction-frame air-lock vestibule at upstream end door of central control station	ca. 1970

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 6)

Addition-boat launches on lock walls	ca. 1970
Replacement-haulage units	ca. 1971 and 1973
Construction-metal and glass shelters around land wall control cabinets and at end of the guidewall of lock	ca. 1972
Removal-Lockmaster/Assistant Lockmaster residences from esplanade	ca. 1975
Removal-standby generator for machinery room of central control station	ca. 1975
Construction-emergency generator building	ca. 1975
Installation-traveling mooring kevels extending length of guidewalls of lock	ca. 1979
Replacement-window in downstream end of central control station with door and construction scooter shed just outside this door	ca. 1980
Construction-new workshop building	1980-81
Replacement-crane on dam	1983-84
Replacement-light posts and light fixtures around lock	1984

B. Historical Context:

The special board of engineers which initially designed the Nine-Foot Channel Project did not see the construction of Lock and Dam Complex 17 as a high priority within the context of the overall project and placed it in the third group of projects to be constructed.

The site of Lock and Dam 17 was inaccessible from the nearest highway. Several of the prospective bidders contemplated the construction of a railroad spur from New Boston, Illinois, to the lock site. But the actual contractors, Massman Construction Company and the Massman-Peterman Company, constructed a 3.7 mile-long entrance road. Edward M. Rocho, a roadway and grading contractor from Freeport, Illinois, acting as a subcontractor to the general contractor for the lock began construction on this road, including a bridge across the Bay Island Drainage Ditch, on August 9, 1935, and completed it on December 2, 1935. First, the general

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 7)

contractor for the lock and then the general contractor for the dam maintained this road until the completed project was turned over to the government in 1939. These contractors and their subcontractors used the road to transport some materials to the job. Other materials were brought in either by way of water or by a combination of railroad and truck or railroad and water.

The remoteness of the site caused other problems for the contractors. Unlike in a city, an adequate supply of workers could not commute to the job site from their nearby homes. Massman Construction Company and the Massman-Peterman Company constructed a camp for workers near the lock and dam site. This camp consisted of eleven 16-man bunk houses and a large mess hall. Beginning in August 1935, Charles H. Langman of Rock Island, Illinois, built the government's temporary office, car garage, and privy under the same contract by which he was simultaneously constructing the temporary government buildings at complexes 13 and 14.

The construction of Lock 17 proceeded fairly routinely. However, problems did arise during the construction of the dam which meant that its river wall had to be rebuilt. On January 26, 1938, a cofferdam, being used by the Maxon Construction Company in the construction of Dam 17, broke and one of the monoliths of the lock riverwall moved as a result. This led to a plethora of reports, claims, and counterclaims.

Most specific items of engineering significance at these as well as at this complex 21 relate to their including examples of the most mature forms in the Rock Island District of complex elements which developed during the course of the 10 year, Upper Mississippi River Nine Foot Channel Project. Complex 17 offers the best examples of the final end products of the evolutionary design process as it occurred in the Rock Island District and is, unlike complexes 13 and 14, typical of standard complex arrangement. And, although the Corps did find it necessary to alter the lock to improve navigability in and out of its upstream end, these alterations were neither as extensive nor as immediately needed as those at complexes 11, 13, 14, and 16. All the Corps added was an 800-foot-long earthen approach dike, and it did not put this in until 1950-51, by which time the complex was over 10 years old.

The dam system of Complex 17 consists of 19 2b-type Tainter gates, 3 submersible roller gates, 1 non-overflow earth and sand-filled dike, 2 transitional dikes, and a submergible earth and sand-filled dike. Lock dimensions are the standard 110 feet by 60 feet with additional footings for an auxiliary lock of standard dimensions. Lock lift is 8 feet. Normal upper pool elevation is 536.0; this is about 12 feet above the tail waters of the dam at low water. When both pools are at their normal elevation, the difference is reduced to 8 feet or less.

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 8)

The lock and dam elements of the complex took a little over four years to complete (or over a year longer than average) at a cost of \$5,638,000. In July 1936, during the peak of construction, 626 men were employed at one time. The complex was placed in operation as a unit of the Upper Mississippi River Nine-Foot Navigation Project on May 14, 1939. It was the tenth of the 1931-1940 Upper Mississippi River Nine-Foot Navigation Project complexes in the Rock Island District to go on line.

PART II. TECHNOLOGICAL INFORMATION - LOCK

A. General Statement:

1. Design Character: Standardized Ohio-Mississippi Lock Design. Drawing Number M-L 17 20/1.
2. Condition of Fabric: Good

B. Description of General Layout and Principal Elements:

1. Overall dimensions: Main lock chamber - 110 feet wide by 600 feet long by 40 feet high; adjoining incomplete auxiliary lock chamber 110 feet wide by 40 feet high. Lift - 8.5 feet. Drawing Number M-L 17 20/1.
2. Foundations: 30-foot-round timber pile with 25 to 30-foot sheet pile cutoff walls enclosing outside limit. Drawing Number M-L 17 20/2.
3. Walls: Reinforced monolithic concrete with steel rub bars on their chamberward faces upstream and downstream from the lock gates. Land wall adjoins Illinois shore. Intermediate wall is riverward wall of main lock and landward wall of incomplete auxiliary lock. River wall of auxiliary lock ties to dam on west. Drawing Numbers M-L 17 20/4, 20/6, 20/9, 20/19, 20/20, 20/28, 40/1.
4. Structural System: See above.
5. Bullnoses: Concrete configurations at each end of intermediate wall. Drawing Number M-L 17 20/19.
6. Upper and Lower Guidewalls: Extended monolithic reinforced concrete walls extending the landwall out of the lock chamber at either end to assist guiding of barge traffic into the lock. Drawing Number M-L 17 20/11.
7. Guidewall Extension: 800-foot-long earthen mooring dike extension to upstream end of guidewall to assist in guiding barge traffic into the lock.

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 9)

8. Stage Recorder: Small concrete housing located at the end of the downstream guidewall. Equipment housed for the recording of river stages.

C. Mechanical Equipment:

1. Tainter Valves: Four cable drive lock valves of steel construction with electric motorized assembly. Valves are located in wells in lock walls. They are operated by switches in weather-proof control cabinets on lock walls, with a cabinet beside each gate recess. Control cabinets on landwall surrounded by metal and glass shelters since mid-1970s. Drawing Numbers M-L 17 25/1A, 28/1A, 20/12A.
2. Gates: Two pairs of miter gates on main lock and one pair on upstream end of incomplete auxiliary lock. All three pairs are balanced on stainless steel pintels. Those in main lock are operated by arms, gears, and electric motor assemblies. Motor assemblies housed in machinery pits in lock walls adjacent to each leaf. Bumper lines of chamber face of gates also of stainless steel. All other associated metal parts are of steel, stainless steel, or steel/nickel alloy. Drawing Numbers M-L 17 21/1, 21/17, 22/1.
3. Lighting: Various freestanding single and double head lighting standards, installed in 1984.
4. Plumbing: Lock is watered by the Tainter valves (see above) serving a system of cast-in-place tunnels that enable the water level to be controlled on the interior of the lock.
5. Haulage Unit: Motorized winch assembly to assist towing of barges through lockage. Replacement units were installed in the mid-1970s.
6. Traveling Mooring Kevels: Two large cleats on rails which extends the length of both the upstream and downstream guidewalls. Installed in 1980, the kevels are used to assist towing of barges through lockage.

D. Other Elements:

1. Auxiliary Lock: Fixed miter gate without machinery and partial walls are located riverward of the main lock. It is equipped with wells for machinery placement, but was never completed or put into service. Drawing Numbers M-L 17 20/1; 20/5.

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 10)

2. Boat Launches: Installed ca. 1970, the launches are four single-armed derricks of metal construction.

PART III. TECHNOLOGICAL INFORMATION--MOVABLE SECTION OF DAM

A. General Statement:

1. Design Character: Combination roller/tainter low dam system design. Drawing Number M-L 17 40/1.
2. Architectural Character: 2b roller gate piers. Drawing Number M-L 17 40/2
3. Condition of Fabric: Excellent.

B. Description of Exterior

1. Overall Dimensions: 1,121 feet in length. Drawing Number M-L 17 40/1.
2. Foundation: 30-floor round timber pile with 25 to 30-foot sheet piling cutoff wall enclosing outside limit.
3. Pier House Walls: Monolithic reinforced concrete. Drawing Numbers M-L 17 41/1 and 41/2.
4. Structural System: Monolithic concrete/structural steel.
5. Fenders: Concrete fenders located at the base of each pier.
6. Openings:
 - a. In Overall Structures: 11 water-channels and 2 archways; clustered in groups by sizes, east to west--4 water-channels ca. 64 feet wide; 3 water-channels ca. 100 feet wide; 4 water-channels ca. 64 feet wide; 2 archways ca. 60 feet wide. Drawing Number M-L 17 40/1.
 - b. In Pier Houses: 1 doorway, and 11 three-paned windows for each of four pier houses.. Drawing Number M-L 17 40/2.
 - (1) Doorways and doors: 4
 - (2) Windows: 44

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 11)

- c. In Access Tower: 2 doorways and doors. Drawing Number M-L 17 40/4.

7. Roofs:

- a. Shape, covering: Pier houses have flat roofs covered in membrane/tar composition. Drawing Number M-L 17 41/3.
- b. Towers, abutments, piers: 2 abutments; lockwall abutments includes access tower; 12 piers (6 tainter gate piers, 2 2a-style roller gate piers, 2 2a-style transition piers or combination tainter and roller gate piers, and 2 service bridge extension piers); 4 2a-style piers have pier house towers. Drawing Numbers M-L 17 40/1, 40/4, 40/18, 40/3, 40/2, 40/10, 40/12, 40/14, 40/26.

8. Service Bridge:

- a. Shape: Arched spans in a segmental series.
- b. Materials: Structural steel. Drawing Number M-L 17 53/1.

C. Description of General Layout and Principal Elements:

- 1. Access Plan: Simple stairway in the access tower which itself is part of the abutment resting on the riverwall of the auxiliary lock. This stairway leads to service bridge deck where walkway/rail tracks extend full length of dam. Access to all four pier houses directly off deck. Access to storage yard below easternmost 200 feet of dam by simple exposed stairway at the western end of service bridge. Drawing Numbers M-L 17 40/1, 40/4, 53/1, 53/9, 53/10.
- 2. Stairways: In access tower--reinforced concrete with pipe railing; at end of service bridge extension--open metal with pipe railing. Drawing Numbers M-L 17 40/4, 53/1.
- 3. Flooring: In pier houses and access tower--reinforced concrete; on service bridge deck--wooden plank. Drawing Numbers M-L 17 40/4, 53/10.
- 4. Wall and Ceiling Finish: Reinforced concrete. Drawing Numbers M-L 17 40/4, 40/5.
- 5. Hardware: Brass.

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 12)

D. Mechanical Equipment:

1. Movable Gates: Eight 64-foot-wide by 20 feet high, 2b-type Tainter gates operated by line shafts and motors housed in installations above each gate; 3,100-foot-wide by 20 feet high submersible roller gates operated on tooth track by chain driven hoist machinery located in pier house adjacent to each gate. Drawing Numbers M-L 17 48/1, 47/1, 55/1, 54/1.
2. Movable Crane: 30-ton vertical lift electric crane with 70-foot boom (replaced in 1983-84) used for moving parts and equipment. Sits on original (ca. 1938) crane trolley which also supports additional bridge crane used for lifting emergency bulkheads, etc. Trolley rides on 15-gauge track system running entire length of service bridge deck. Drawing Numbers M-L 17 53/11, 53/10, 58/5.
3. Lighting: Fixtures as of times of installation - 1938-39. Rewiring may have taken place over the years--extent is unknown. Drawing Number M-L 17 56/1.

E. Other Elements:

1. Earth Dikes: Four dikes in segmental series--10 to 1 transition earth and sand-filled transition dike extends from eastern edge of storage yard of movable dam to a 1,555-foot-long linear submersible earth and sand-filled dike followed by another 10 to 1 slope transition dike. The remaining 230 feet of the dam is a linear non-overflow earth and sand-filled dike extending to the Louisa County levee along the Iowa shore. Drawing Numbers M-L 17 40/1, 52/1, 52/2.
2. Emergency Bulkheads: Temporary block units of riveted structural steel girder construction placed in gate openings in periods of emergency or repair. Drawing Numbers M-L 17 58/1; 58/4.
3. Emergency Bulkhead Car/Tracks: Located in storage yard, the flat cars designed to store and access bulkheads. Drawing Number M-L 17 53/11, 40/25.
3. Storage Yard: 200-foot-long area extending from west abutment under service bridge extension, i.e., under last two archways in dam. The yard contains replacement parts for gates, bulkheads on track cars and related repair items. Drawing Number M-L 17 40/25.

PART IV: TECHNOLOGICAL INFORMATION--ESPLANADE AREA

A. Description of Esplanade--General Layout:

1. Design Character: Standardized park/service area and access road component. The main esplanade area has an overall width of about 295 feet and an overall length of about 923 feet. It was originally designed to accommodate the Central Control Station, Lockmaster and Assistant Lockmaster Residences, parking, an access road, and other service-related functions. Major site alterations have occurred since that time and are noted in the following items.
2. Architectural Character: 2b Central Control Station. Drawing Number M-L 17 70/1.
3. Historic Landscape Design: Based on standardized designs--see drawings for Lockmaster's residences and roadway. Drawing number M-L 17 101/1.

B. Condition of Site and Structures: Altered

1. Central Control Station - Exterior: Standardized 2b construction. Drawing Number M-L 17 70/1.
 - a. First Floor: Contains machinery room where central control panel located, main office, work room, and mezzanine and basement stairway accesses. Standby generator which dominated machinery room removed in mid-1970s. Drawing Number M-L 17 70/2.
 - b. Mezzanine: Contains bathroom and locker room. Drawing Number M-L 17 70/2.
 - c. Basement: Contains storage and equipment rooms. All interior finishes altered from original construction. Drawing Number M-L 17 70/2.
2. Lockmaster's/Assistant Lockmaster's Residences (standardized, Colonial Revival with side porch): The structures has been moved off site. Related structures, such as garages, have been demolished.
3. Outbuildings: Various shed and service buildings have been erected from time to time as demands required--none have particular significance or contribute to the site. A metal emergency generator building was constructed just upstream from the Central Control Station in the mid-1970s. It is a standardized element. A new garage structure of brick and steel was erected on the old site of the Lockmaster's residence ca. 1980. This element is also standardized.

Upper Mississippi River Nine-Foot Channel
Project, Lock and Dam Number 17
HAER No. IL-28
(Page 14)

PART V: SOURCES OF INFORMATION

- A. Original Architectural/Engineering Drawings: Mississippi River Lock and Dam 17, lock operations folio, file No. GP63-1; Mississippi River, Lock and Dam 11, dam operations folio, February 1940, file No. GP63-2; Rock Island District Office-Construction Drawings--Mississippi River Locks and Dams 1940-1986, (passim), Rock Island District Library, Clock Tower Building Annex, Rock Island, Illinois.
- B. Early Views: Over 2,200 high quality 8x10 black and white construction photographs: Lock and Dam Number 17-Photo Book groups 1750 (6 vols.), 1730 (4 vols.), 1750, Rock Island Arsenal, Rock Island, Illinois.
- C. Interviews: Present and past personnel--Lock and Dam Number 17, near New Boston, Illinois.
- D. Bibliography:
 - 1. Primary and unpublished sources: National Archives Record Group 77, Entry 81, Chicago National Archives and Records Center; National Archives Record Group 77, Entries 111 and 112, Washington National Records Center, Suitland, Maryland; Chief of Engineers Annual Reports, 1927-1987; see also bibliography in HAER No. IA-23 narrative history.
 - 2. Secondary and published sources: See bibliography in HAER No. IA-23 narrative history.
- E. Likely Sources Not Yet Investigated: National Archives Record Group 77, Entry 107 (132 linear feet), Washington National Records Center, Suitland, Maryland; National Archives Record Group 77, Entry 1656, exact repository unknown; and National Archives Record Group 77, Entries 608, 609, and 610 (collective total 5 linear feet), National Archives, Washington, DC.
- F. Supplemental Material: 83 film canisters of 1931-1939 silent movies of the construction process taken by the Corps of Engineers, Rock Island District Office, Rock Island Arsenal, Rock Island, Illinois.
- G. Notes: The notes for this outline are contained in the notes section of HAER No. IA-23 narrative history.